

### REMARKS

Claims 1-3 and 20-23 are pending with claim 20 having been withdrawn from consideration. Claims 1, 20, 23 have been amended for further clarification of the subject matter. Support for these amendments can be found in the specification at, for example, page 12, lines 5-8.

### REJECTIONS UNDER 35 U.S.C. § 103

Claims 1-3 and 21-23 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Masuda et al. (US 5,529,832) in view of Kobayashi et al. (US 3,676,612). Applicants respectfully request reconsideration.

Independent claims 1 and 23 recite a functional roll film comprising a plastic film and an inorganic oxide layer on at least one surface of the plastic film, wherein the inorganic oxide layer is deposited by vacuum evaporation.

Because it is deposited by vacuum evaporation, the inorganic oxide layer is free of any organic polymeric materials. This is because any organic polymeric materials would decompose under the heat of evaporation. Additional technical information about the vacuum evaporation process is provided to the Examiner in the attached article entitled "Vacuum Deposition Processes."

In contrast to the claimed inventions, Masuda discloses a film comprising two polyester surface layers, where the polyester surface layers are made of polyester resin that may incorporate inert fine particles that may be inorganic (see, e.g., col. 3, line 53 – col. 4, line 7; col. 5, lines. 15-19, 30-45). Thus, these polyesters surface layers in Masuda have a polyester resin (which is excluded from the inorganic oxide layers recited in claims 1 and 23) mixed with the inorganic fine particles incorporated therein.

The deficiencies of Masuda are not corrected by Kobayashi because Kobayashi also does not disclose an inorganic oxide layer, as in Applicants' claimed inventions. Hence, their combination would also fail to do so.

Moreover, Applicants have discovered that the claimed inorganic oxide layer on a surface of a plastic film provides improved film flexibility and gas barrier properties (see, e.g.,

specification at page 4, lines 3-7). For at least these reasons, the inventions of claims 1 and 23, and the claims that depend therefrom, are patentable over Masuda in view of Kobayashi.

### **CONCLUSION**

Applicants respectfully submit that the present application is in condition for allowance. The Examiner is invited to contact Applicants' representative to discuss any issue that would expedite allowance of this application.

In case the filing of this paper is deemed untimely, Applicants request an extension of time. The Commissioner is authorized to charge all required fees, fees under § 1.17, or all required extension of time fees, or to credit any overpayment to Deposit Account No. 11-0600 (Kenyon & Kenyon LLP).

Respectfully submitted,

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## Vacuum Deposition Processes

<http://www.pfonline.com/articles/069901.html>

*Vacuum deposition processes, equipment and applications are continually evolving...*

*By Donald M. Mattox*

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In a vacuum, gas pressure is less than the ambient atmospheric pressure. A plasma is a gaseous environment where there are enough ions and electrons for there to be appreciable electrical conductivity. Vacuum deposition is the deposition of a film or coating in a vacuum (or low-pressure plasma) environment. Generally, the term is applied to processes that deposit atoms or molecules one at a time, such as in physical vapor deposition (PVD) or low-pressure chemical vapor deposition (LPCVD) processes. It can also be applied to other deposition processes such as low-pressure plasma spraying (LPPS).

The vacuum in deposition processing increases the "mean free path" for collisions of atoms and high-energy ions and helps reduce gaseous contamination to an acceptable level. When establishing a plasma in a vacuum, the gas pressure plays an important role in the enthalpy, the density of charged and uncharged particles and the energy distribution of particles in the plasma. A plasma in a "good vacuum" provides a source of ions and electrons that may be accelerated to high energies in an electric field.

In PVD processing, these high-energy ions can be used to sputter a surface as a source of deposition material and/or bombard a growing film to modify the film properties. Ion bombardment effects can also be found in LPCVD. The plasma may also be used to "activate" reactive gases and vapors in reactive deposition processes and fragment the chemical vapor precursors in plasma-enhanced chemical vapor deposition (PECVD).



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**PVD.** Physical vapor deposition processes are atomistic where material vaporized from a solid or liquid source is transported as a vapor through a vacuum or low-pressure gaseous or plasma environment. When it contacts the part, it condenses.

The vaporized material may be an element, alloy or compound. Some PVD processes can be used to deposit films of compound materials (reactive deposition) by the reaction of depositing material with the gas in the deposition environment (e.g., TiN) or with a co-depositing material such as TiC or even a combination of the two.

Typically, PVD processes are used to deposit films with thicknesses in the range of a few nanometers to thousands of nanometers; however, they can be used to form multilayer coatings, thick deposits and free-standing structures.

**Vacuum evaporation.** Vacuum evaporation (including sublimation) is a PVD process where material from a thermal vaporization source reaches the substrate without collision with gas molecules in the space between the source and substrate. The trajectory of the vaporized material is "line-of-sight." Typically, vacuum evaporation takes place in a gas pressure range of  $10^{-5}$  to  $10^{-9}$  Torr, depending on the level of contamination that can be tolerated in the deposited film. For an appreciable deposition rate to be attained, the material vaporized must reach a temperature where its vapor pressure is 10 mTorr or higher. Typical vaporization sources are resistively heated stranded wires, boats or crucibles (for vaporization temperatures below 1,500C) or high-energy electron beams that are focused and rastered over the surface of the source material (any temperature). [Figure 1](#) shows several vacuum evaporation source configurations.

**Advantages of vacuum evaporation:**

- High-purity films can be deposited from high-purity source material.
- Source of material to be vaporized may be a solid in any form and purity.
- The line-of-sight trajectory and "limited-area sources" allow the use of masks to define areas of deposition on the substrate and shutters between the source and substrate to prevent deposition when not desired.
- Deposition rate monitoring and control are relatively easy.
- It is the least expensive of the PVD processes.

**Disadvantages of vacuum evaporation:**

- Many compounds and alloy compositions can only be deposited with difficulty.
- Line-of-sight and limited-area sources result in poor surface coverage on complex surfaces unless there is proper fixturing and movement.

- Line-of-sight trajectories and limited-area sources result in poor film-thickness uniformity over large areas without proper fixturing and movement.
- Few processing variables are available for film property control.
- Source material use may be low.
- High radiant heat loads can exist in the deposition system.
- Large-volume vacuum chambers are generally required to keep an appreciable distance between the hot source and the substrate.

Vacuum evaporation is used to form optical interference coatings using high and low index of refraction materials, mirror coatings, decorative coatings, permeation barrier films on flexible packaging materials, electrically conducting films and corrosion protective coatings. When depositing metals, vacuum evaporation is sometimes called vacuum metallization.